

CLAIMS

1. A magnetic head, in which a multilayer film is disposed, the multilayer film including metal magnetic films and non-magnetic films that are alternately laminated, and a boundary between the multilayer film and a magnetic oxide substrate or a non-magnetic substrate on which the multilayer film is to be formed is parallel with a gap section at a surface of the magnetic head for sliding with respect to a magnetic recording medium, wherein the metal magnetic films constituting the multilayer film have two or more types of thickness, or the metal magnetic films constituting the multilayer film have a uniform thickness, and the uniform thickness t satisfies $t < v \times \cos\theta / f_{\max}$, where v denotes a relative speed of the head to the recording medium, f_{\max} denotes an upper limit of frequencies to be used and θ denotes an azimuth angle.
2. The magnetic head according to claim 1, wherein the metal magnetic films constituting the multilayer film have thicknesses varied within a range of 100 nm to 2000 nm.
3. The magnetic head according to claim 1, wherein a difference in thicknesses of the metal magnetic films constituting the multilayer film is 5% or more.
4. The magnetic head according to claim 1, wherein the metal magnetic films constituting the multilayer film have a uniform thickness within a range of 100 nm to 2000 nm.
5. The magnetic head according to claim 1, wherein the magnetic films comprise a magnetic alloy film having a composition represented by the following formula:
$$\text{TaMbXcNd}$$
where T denotes at least one element selected from the group consisting of Fe, Co and Ni, M denotes at least one element selected from the group constituting of Nb, Zr, Ti, Ta, Hf, Cr, Mo, W and Mn, X denotes at least one element selected from the group consisting of B, Si and Ge, and N denotes nitrogen, wherein a , b , c and d represent atomic% satisfying $65 \leq a$

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≤ 93 , $4 \leq b \leq 20$, $0 \leq c \leq 20$, $2 \leq d \leq 20$ and $a + b + c + d = 100$, respectively.

6. The magnetic head according to claim 1, wherein the non-magnetic films comprise an oxide of Si, Al, Ti, Cr or Ta.

7. The magnetic head according to claim 1, wherein the substrate comprises: magnetic Mn-Zn ferrite single crystal; non-magnetic ferrite single crystal; α -hematite; calcium titanate or magnesium titanate.

8. A magnetic recording/reproducing device provided with a magnetic head, in which a multilayer film is disposed, the multilayer film including metal magnetic films and non-magnetic films that are alternately laminated, and a boundary between the multilayer film and a magnetic oxide substrate or a non-magnetic substrate on which the multilayer film is to be formed is parallel with a gap section at a surface of the magnetic head for sliding with respect to a magnetic recording medium,

wherein the metal magnetic films constituting the multilayer film have two or more types of thickness, or

the metal magnetic films constituting the multilayer film have a uniform thickness, and the uniform thickness t satisfies $t < v \times \cos\theta / f_{\max}$, where v denotes a relative speed of the head to the recording medium, f_{\max} denotes an upper limit of frequencies to be used and θ denotes an azimuth angle.

9. The magnetic recording/reproducing device according to claim 8, wherein the metal magnetic films constituting the multilayer film have thicknesses varied within a range of 100 nm to 2000 nm.

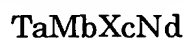
10. The magnetic recording/reproducing device according to claim 8, wherein a difference in thicknesses of the metal magnetic films constituting the multilayer film is 5% or more.

11. The magnetic recording/reproducing device according to claim 8, wherein the metal magnetic films constituting the multilayer film have a uniform thickness within a range of 100 nm to 2000 nm.

12. The magnetic recording/reproducing device according to claim 8,

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wherein the magnetic films comprise a magnetic alloy film having a composition represented by the following formula:



where T denotes at least one element selected from the group consisting of Fe, Co and Ni, M denotes at least one element selected from the group constituting of Nb, Zr, Ti, Ta, Hf, Cr, Mo, W and Mn, X denotes at least one element selected from the group consisting of B, Si and Ge, and N denotes nitrogen, wherein a, b, c and d represent atomic% satisfying $65 \leq a \leq 93$, $4 \leq b \leq 20$, $0 \leq c \leq 20$, $2 \leq d \leq 20$ and $a + b + c + d = 100$, respectively.

13. The magnetic recording/reproducing device according to claim 8, wherein the non-magnetic films comprise an oxide of Si, Al, Ti, Cr or Ta.

14. The magnetic recording/reproducing device according to claim 8, wherein the substrate comprises: magnetic Mn-Zn ferrite single crystal; non-magnetic ferrite single crystal; α -hematite; calcium titanate or magnesium titanate.

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